X-ray diffraction phase analyses for granulated and sintered ceramic mataerials

---

Abstrak

One basic problematic aspect in x-ray diffraction phase analysis is microabsorption effect which may arise from the size
of the crystallite phases. Complication of the problem may intensify in sintered ceramic materials where milling of the
samples is not simple. We report the Rietveld x-ray diffraction phase analysis of MgO-􀁡-Al2O3 powder mixtures with
phase content ratio of 1:1 by weight and MgO-Y2O3 sintered ceramic composites with Y2O3 contents of 10%, 20% and
30% by weight. The mixtures were pre-sintered at 1000􀂰C for 2 hours and then milled while the composites were
sintered at 1550􀂰C for 3 hours. The phase composition analysis was done using Rietica, a non-commercial Rietveld
method-based software. Relative and absolute phase compositions were examined and results showed that there was a
significant amount of phase composition bias resulted from the examination. For the powder mixture, milling can reduce
microabsorption effect and hence the calculation bias. For the ceramic composite where milling is almost impossible,
additional of Y2O3 caused smaller crystallite size of MgO, so that composition bias is smaller in composites with higher
Y2O3 content. A mathematical model is proposed to provide more acceptable phase composition results.